

SEQUENCE LISTING



10

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<120> METHOD FOR PRODUCING L-GLUTAMIC ACID BY FERMENTATION ACCOMPANIED BY PRECIPITATION

<130> 195942US0

<140> 09/641,892

<141> 2000-08-18

<150> JP2000-78771

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<151> 1999-08-20

<160> 12

<170> PatentIn version 3.0

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<212> DNA

<213> Enterobacter agglomerans

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His	Leu	Gly	Thr	Gly	Asp	Val	Lys	Tyr	His	Met	Gly	Phe	Ser	Ser	Asp		
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Ile	Glu	Thr	Glu	Gly	Gly	Leu	Val	His	Leu	Ala	Leu	Ala	Phe	Asn	Pro		
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Arg	Leu	Asp	Arg	Leu	Ala	Glu	Pro	Val	Ser	Asn	Lys	Val	Leu	Pro	Ile		
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Pro Gly Thr Gly Val Lys Pro Glu Gln Phe His Ser Ala Thr Arg Glu
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Tyr Phe Arg Arg Leu Ala Lys Asp Ala Ser Arg Tyr Thr Ser Ser Val
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Thr Asp Pro Ala Thr Asn Ser Lys Gln Val Lys Val Leu Gln Leu Ile
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Asn Ala Phe Arg Phe Arg Gly His Gln Glu Ala Asn Leu Asp Pro Leu
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Gly Leu Trp Lys Gln Asp Arg Val Ala Asp Leu Asp Pro Ala Phe His
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Ala Ile Gly Lys Glu Thr Met Lys Leu Ala Asp Leu Phe Asp Ala Leu
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Lys Gln Thr Tyr Cys Gly Ser Ile Gly Ala Glu Tyr Met His Ile Asn
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Asn Pro Ser His Leu Glu Ile Val Ser Pro Val Val Met Gly Ser Val
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Pro Ile Thr Ile His Gly Asp Ala Ala Val Ile Gly Gln Gly Val Val
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Thr Val Arg Ile Val Ile Asn Asn Gln Val Gly Phe Thr Thr Ser Asn
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Pro Lys Asp Ala Arg Ser Thr Pro Tyr Cys Thr Asp Ile Gly Lys Met
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Val Leu Ala Pro Ile Phe His Val Asn Ala Asp Asp Pro Glu Ala Val
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Ala Phe Val Thr Arg Leu Ala Leu Asp Tyr Arg Asn Thr Phe Lys Arg
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Asp Val Phe Ile Asp Leu Val Cys Tyr Arg Arg His Gly His Asn Glu
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Ala Asp Glu Pro Ser Ala Thr Gln Pro Leu Met Tyr Gln Lys Ile Lys
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Lys His Pro Thr Pro Arg Lys Ile Tyr Ala Asp Arg Leu Glu Gly Glu
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Ala Lys Ile Tyr Asn Asp Arg Lys Leu Met Ala Glu Gly Glu Lys Ala
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Glu Gly Ile Pro Val Arg Leu Ser Gly Glu Asp Ser Gly Arg Gly Thr
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Tyr Thr Pro Leu His His Ile His Asn Ser Gln Gly Glu Phe Lys Val
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Trp Asp Ser Val Leu Ser Glu Glu Ala Val Leu Ala Phe Glu Tyr Gly
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Gly Asp Phe Ala Asn Gly Ala Gln Val Val Ile Asp Gln Phe Ile Ser
 690 695 700

Ser Gly Glu Gln Lys Trp Gly Arg Met Cys Gly Leu Val Met Leu Leu
 705 710 715 720

Pro His Gly Tyr Glu Gly Gln Gly Pro Glu His Ser Ser Ala Arg Leu
 725 730 735

Glu Arg Tyr Leu Gln Leu Cys Ala Glu Gln Asn Met Gln Val Cys Val
 740 745 750

Pro Ser Thr Pro Ala Gln Val Tyr His Met Leu Arg Arg Gln Ala Leu
 755 760 765

Arg Gly Met Arg Arg Pro Leu Val Val Met Ser Pro Lys Ser Leu Leu
 770 775 780

Arg His Pro Leu Ala Ile Ser Ser Leu Asp Glu Leu Ala Asn Gly Ser
 785 790 795 800

Phe Gln Pro Ala Ile Gly Glu Ile Asp Asp Leu Asp Pro Gln Gly Val
 805 810 815

Lys Arg Val Val Leu Cys Ser Gly Lys Val Tyr Tyr Asp Leu Leu Glu
 820 825 830

Gln Arg Arg Lys Asp Glu Lys Thr Asp Val Ala Ile Val Arg Ile Glu
835 840 845

Gln Leu Tyr Pro Phe Pro His Gln Ala Val Gln Glu Ala Leu Lys Ala
850 855 860

Tyr Ser His Val Gln Asp Phe Val Trp Cys Gln Glu Glu Pro Leu Asn
865 870 875 880

Gln Gly Ala Trp Tyr Cys Ser Gln His His Phe Arg Asp Val Val Pro
885 890 895

Phe Gly Ala Thr Leu Arg Tyr Ala Gly Arg Pro Ala Ser Ala Ser Pro
900 905 910

Ala Val Gly Tyr Met Ser Val His Gln Gln Gln Gln Gln Asp Leu Val
915 920 925

Asn Asp Ala Leu Asn Val Asn
930 935

<210> 4

<211> 407

<212> PRT

<213> Enterobacter agglomerans

<400> 4

Met Ser Ser Val Asp Ile Leu Val Pro Asp Leu Pro Glu Ser Val Ala
1 5 10 15

Asp Ala Thr Val Ala Thr Trp His Lys Lys Pro Gly Asp Ala Val Ser
20 25 30

Arg Asp Glu Val Ile Val Glu Ile Glu Thr Asp Lys Val Val Leu Glu
35 40 45

Val Pro Ala Ser Ala Asp Gly Val Leu Glu Ala Val Leu Glu Asp Glu
50 55 60

Gly Ala Thr Val Thr Ser Arg Gln Ile Leu Gly Arg Leu Lys Glu Gly
65 70 75 80

Asn Ser Ala Gly Lys Glu Ser Ser Ala Lys Ala Glu Ser Asn Asp Thr
85 90 95

Thr Pro Ala Gln Arg Gln Thr Ala Ser Leu Glu Glu Glu Ser Ser Asp
100 105 110

Ala Leu Ser Pro Ala Ile Arg Arg Leu Ile Ala Glu His Asn Leu Asp
115 120 125

Ala Ala Gln Ile Lys Gly Thr Gly Val Gly Gly Arg Leu Thr Arg Glu
130 135 140

Asp Val Glu Lys His Leu Ala Asn Lys Pro Gln Ala Glu Lys Ala Ala
145 150 155 160

Ala Pro Ala Ala Gly Ala Ala Thr Ala Gln Gln Pro Val Ala Asn Arg
165 170 175

Ser Glu Lys Arg Val Pro Met Thr Arg Leu Arg Lys Arg Val Ala Glu
180 185 190

Arg Leu Leu Glu Ala Lys Asn Ser Thr Ala Met Leu Thr Thr Phe Asn
195 200 205

Glu Ile Asn Met Lys Pro Ile Met Asp Leu Arg Lys Gln Tyr Gly Asp
210 215 220

Ala Phe Glu Lys Arg His Gly Val Arg Leu Gly Phe Met Ser Phe Tyr
225 230 235 240

Ile Lys Ala Val Val Glu Ala Leu Lys Arg Tyr Pro Glu Val Asn Ala
245 250 255

Ser Ile Asp Gly Glu Asp Val Val Tyr His Asn Tyr Phe Asp Val Ser
260 265 270

Ile Ala Val Ser Thr Pro Arg Gly Leu Val Thr Pro Val Leu Arg Asp
275 280 285

Val Asp Ala Leu Ser Met Ala Asp Ile Glu Lys Lys Ile Lys Glu Leu
290 295 300

Ala Val Lys Gly Arg Asp Gly Lys Leu Thr Val Asp Asp Leu Thr Gly
305 310 315 320

Gly Asn Phe Thr Ile Thr Asn Gly Gly Val Phe Gly Ser Leu Met Ser
 325 330 335

Thr Pro Ile Ile Asn Pro Pro Gln Ser Ala Ile Leu Gly Met His Ala
 340 345 350

Ile Lys Asp Arg Pro Met Ala Val Asn Gly Gln Val Val Ile Leu Pro
 355 360 365

Met Met Tyr Leu Ala Leu Ser Tyr Asp His Arg Leu Ile Asp Gly Arg
 370 375 380

Glu Ser Val Gly Tyr Leu Val Ala Val Lys Glu Met Leu Glu Asp Pro
 385 390 395 400

Ala Arg Leu Leu Leu Asp Val
 405

<210> 5

<211> 40

<212> PRT

<213> Enterobacter agglomerans

<400> 5

Met Asn Leu His Glu Tyr Gln Ala Lys Gln Leu Phe Ala Arg Tyr Gly
 1 5 10 15

Met Pro Ala Pro Thr Gly Tyr Ala Cys Thr Thr Pro Arg Glu Ala Glu
 20 25 30

Glu Ala Ala Ser Lys Ile Gly Ala
 35 40

<210> 6

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<221> misc_feature

<223> Artificial Sequence: synthetic DNA

<400> 6
gtcgacaata gccygaatct gttctggtcg

30

<210> 7

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<221> misc_feature

<223> Artificial Sequence: synthetic DNA

<400> 7
aagcttatcg acgctcccct cccaccgtt

30

<210> 8

<211> 936

<212> PRT

<213> Escherichia coli

<400> 8

Met Gln Asn Ser Ala Leu Lys Ala Trp Leu Asp Ser Ser Tyr Leu Ser
1 5 10 15

Gly Ala Asn Gln Ser Trp Glu Ile Glu Gln Leu Tyr Glu Asp Phe Leu
20 25 30

Thr Asp Pro Asp Ser Val Asp Ala Asn Trp Arg Ser Thr Phe Gln Gln
35 40 45

Leu Pro Gly Thr Gly Val Lys Pro Asp Gln Phe His Ser Gln Thr Arg
50 55 60

Glu Tyr Phe Arg Arg Leu Ala Lys Asp Ala Ser Arg Tyr Ser Ser Thr
65 70 75 80

Ile Ser Asp Pro Asp Thr Asn Val Lys Gln Val Lys Val Leu Gln Leu
 85 90 95
 Ile Asn Ala Tyr Arg Phe Arg Gly His Gln His Ala Asn Leu Asp Pro
 100 105 110
 Leu Gly Leu Trp Gln Gln Asp Lys Val Ala Asp Leu Asp Pro Ser Phe
 115 120 125
 His Asp Leu Thr Glu Ala Asp Phe Gln Glu Thr Phe Asn Val Gly Ser
 130 135 140
 Phe Ala Ser Gly Lys Glu Thr Met Lys Leu Gly Glu Leu Leu Glu Ala
 145 150 155 160
 Leu Lys Gln Thr Tyr Cys Gly Pro Ile Gly Ala Glu Tyr Met His Ile
 165 170 175
 Thr Ser Thr Glu Glu Lys Arg Trp Ile Gln Gln Arg Ile Glu Ser Gly
 180 185 190
 Arg Ala Thr Phe Asn Ser Glu Glu Lys Lys Arg Phe Leu Ser Glu Leu
 195 200 205
 Thr Ala Ala Glu Gly Leu Glu Arg Tyr Leu Gly Ala Lys Phe Pro Gly
 210 215 220
 Ala Lys Arg Phe Ser Leu Glu Gly Gly Asp Ala Leu Ile Pro Met Leu
 225 230 235 240
 Lys Glu Met Ile Arg His Ala Gly Asn Ser Gly Thr Arg Glu Val Val
 245 250 255
 Leu Gly Met Ala His Arg Gly Arg Leu Asn Val Leu Asn Val Leu Gly
 260 265 270
 Lys Lys Pro Gln Asp Leu Phe Asp Glu Phe Ala Gly Lys His Lys Glu
 275 280 285
 His Leu Gly Thr Gly Asp Val Lys Tyr His Met Gly Phe Ser Ser Asp
 290 295 300
 Phe Gln Thr Asp Gly Gly Leu Val His Leu Ala Leu Ala Phe Asn Pro
 305 310 315 320
 Ser His Leu Glu Ile Val Ser Pro Val Val Ile Gly Ser Val Arg Ala
 325 330 335
 Arg Leu Asp Arg Leu Asp Glu Pro Ser Ser Asn Lys Val Leu Pro Ile
 340 345 350
 Thr Ile His Gly Asp Ala Ala Val Thr Gly Gln Gly Val Val Gln Glu
 355 360 365
 Thr Leu Asn Met Ser Lys Ala Arg Gly Tyr Glu Val Gly Gly Thr Val
 370 375 380
 Arg Ile Val Ile Asn Asn Gln Val Gly Phe Thr Thr Ser Asn Pro Leu
 385 390 395 400

Asp Ala Arg Ser Thr Pro Tyr Cys Thr Asp Ile Gly Lys Met Val Gln
 405 410 415
 Ala Pro Ile Phe His Val Asn Ala Asp Asp Pro Glu Ala Val Ala Phe
 420 425 430
 Val Thr Arg Leu Ala Leu Asp Phe Arg Asn Thr Phe Lys Arg Asp Val
 435 440 445
 Phe Ile Asp Leu Val Ser Tyr Arg Arg His Gly His Asn Asn Glu Ala
 450 455 460
 Asp Glu Pro Ser Ala Thr Gln Pro Leu Met Tyr Gln Lys Ile Lys Lys
 465 470 475 480
 His Pro Thr Pro Arg Lys Ile Tyr Ala Asp Lys Leu Glu Gln Glu Lys
 485 490 495
 Val Ala Thr Leu Glu Asp Ala Thr Glu Met Val Asn Leu Tyr Arg Asp
 500 505 510
 Ala Leu Asp Ala Gly Asp Cys Val Val Ala Glu Trp Arg Pro Met Asn
 515 520 525
 Met His Ser Phe Thr Trp Ser Pro Tyr Leu Asn His Glu Trp Asp Glu
 530 535 540
 Glu Tyr Pro Asn Lys Val Glu Met Lys Arg Leu Gln Glu Leu Ala Lys
 545 550 555 560
 Arg Ile Ser Thr Val Pro Glu Ala Val Glu Met Gln Ser Arg Val Ala
 565 570 575
 Lys Ile Tyr Gly Asp Arg Gln Ala Met Ala Ala Gly Glu Lys Leu Phe
 580 585 590
 Asp Trp Gly Gly Ala Glu Asn Leu Ala Tyr Ala Thr Leu Val Asp Glu
 595 600 605
 Gly Ile Pro Val Arg Leu Ser Gly Glu Asp Ser Gly Arg Gly Thr Phe
 610 615 620
 Phe His Arg His Ala Val Ile His Asn Gln Ser Asn Gly Ser Thr Tyr
 625 630 635 640
 Thr Pro Leu Gln His Ile His Asn Gly Gln Gly Ala Phe Arg Val Trp
 645 650 655
 Asp Ser Val Leu Ser Glu Glu Ala Val Leu Ala Phe Glu Tyr Gly Tyr
 660 665 670
 Ala Thr Ala Glu Pro Arg Thr Leu Thr Ile Trp Glu Ala Gln Phe Gly
 675 680 685
 Asp Phe Ala Asn Gly Ala Gln Val Val Ile Asp Gln Phe Ile Ser Ser
 690 695 700
 Gly Glu Gln Lys Trp Gly Arg Met Cys Gly Leu Val Met Leu Leu Pro
 705 710 715 720

His Gly Tyr Glu Gly Gln Gly Pro Glu His Ser Ser Ala Arg Leu Glu
 725 730 735
 Arg Tyr Leu Gln Leu Cys Ala Glu Gln Asn Asn Gln Val Cys Val Pro
 740 745 750
 Ser Thr Pro Ala Gln Val Tyr His Met Leu Arg Arg Gln Ala Leu Arg
 755 760 765
 Gly Met Arg Arg Pro Leu Val Val Met Ser Pro Lys Ser Leu Leu Arg
 770 775 780
 His Pro Leu Ala Val Ser Ser Leu Glu Glu Leu Ala Asn Gly Thr Phe
 785 790 795 800
 Leu Pro Ala Ile Gly Glu Glu Ile Asp Glu Leu Asp Pro Lys Gly Val
 805 810 815
 Lys Arg Val Val Met Cys Ser Ser Gly Lys Val Tyr Tyr Asp Leu Leu
 820 825 830
 Glu Gln Arg Arg Lys Asn Asn Gln His Asp Val Ala Ile Val Arg Ile
 835 840 845
 Glu Gln Leu Tyr Pro Phe Pro His Lys Ala Met Gln Glu Val Leu Gln
 850 855 860
 Gln Phe Ala His Val Lys Asp Phe Val Trp Cys Gln Glu Glu Pro Leu
 865 870 875 880
 Asn Gln Gly Ala Trp Tyr Cys Ser Gln His His Phe Arg Glu Val Ile
 885 890 895
 Pro Phe Gly Ala Ser Leu Arg Tyr Ala Gly Arg Pro Ala Ser Ala Ser
 900 905 910
 Pro Ala Val Gly Tyr Met Ser Val His Gln Lys Gln Gln Gln Asp Leu
 915 920 925
 Val Asn Asp Ala Leu Asn Val Glu
 930 935

<210> 9

<211> 405

<212> PRT

<213> Escherichia coli

<400> 9

Met Ser Ser Val Asp Ile Leu Val Pro Asp Leu Pro Glu Ser Val Ala
 1 5 10 15
 Asp Ala Thr Val Ala Thr Trp His Lys Lys Pro Gly Asp Ala Val Val
 20 25 30

Arg Asp Glu Val Leu Val Glu Ile Glu Thr Asp Lys Val Val Leu Glu
 35 40 45
 Val Pro Ala Ser Ala Asp Gly Ile Leu Asp Ala Val Leu Glu Asp Glu
 50 55 60
 Gly Thr Thr Val Thr Ser Arg Gln Ile Leu Gly Arg Leu Arg Glu Gly
 65 70 75 80
 Asn Ser Ala Gly Lys Glu Thr Ser Ala Lys Ser Glu Glu Lys Ala Ser
 85 90 95
 Thr Pro Ala Gln Arg Gln Gln Ala Ser Leu Glu Glu Gln Asn Asn Asp
 100 105 110
 Ala Leu Ser Pro Ala Ile Arg Arg Leu Leu Ala Glu His Asn Leu Asp
 115 120 125
 Ala Ser Ala Ile Lys Gly Thr Gly Val Gly Gly Arg Leu Thr Arg Glu
 130 135 140
 Asp Val Glu Lys His Leu Ala Lys Ala Pro Ala Lys Glu Ser Ala Pro
 145 150 155 160
 Ala Ala Ala Ala Pro Ala Ala Gln Pro Ala Leu Ala Ala Arg Ser Glu
 165 170 175
 Lys Arg Val Pro Met Thr Arg Leu Arg Lys Arg Val Ala Glu Arg Leu
 180 185 190
 Leu Glu Ala Lys Asn Ser Thr Ala Met Leu Thr Thr Phe Asn Glu Val
 195 200 205
 Asn Met Lys Pro Ile Met Asp Leu Arg Lys Gln Tyr Gly Glu Ala Phe
 210 215 220
 Glu Lys Arg His Gly Ile Arg Leu Gly Phe Met Ser Phe Tyr Val Lys
 225 230 235 240
 Ala Val Val Glu Ala Leu Lys Arg Tyr Pro Glu Val Asn Ala Ser Ile
 245 250 255
 Asp Gly Asp Asp Val Val Tyr His Asn Tyr Phe Asp Val Ser Met Ala
 260 265 270
 Val Ser Thr Pro Arg Gly Leu Val Thr Pro Val Leu Arg Asp Val Asp
 275 280 285
 Thr Leu Gly Met Ala Asp Ile Glu Lys Lys Ile Lys Glu Leu Ala Val
 290 295 300
 Lys Gly Arg Asp Gly Lys Leu Thr Val Glu Asp Leu Thr Gly Gly Asn
 305 310 315 320
 Phe Thr Ile Thr Asn Gly Gly Val Phe Gly Ser Leu Met Ser Thr Pro
 325 330 335
 Ile Ile Asn Pro Pro Gln Ser Ala Ile Leu Gly Met His Ala Ile Lys
 340 345 350

Asp Arg Pro Met Ala Val Asn Gly Gln Val Glu Ile Leu Pro Met Met
 355 360 365

Tyr Leu Ala Leu Ser Tyr Asp His Arg Leu Ile Asp Gly Arg Glu Ser
 370 375 380

Val Gly Phe Leu Val Thr Ile Lys Glu Leu Leu Glu Asp Pro Thr Arg
 385 390 395 400

Leu Leu Leu Asp Val
 405

<210> 10

<211> 41

<212> PRT

<213> Enterobacter agglomerans

<400> 10

Met Asn Leu His Glu Tyr Gln Ala Lys Gln Leu Phe Ala Arg Tyr Gly
 1 5 10 15

Met Pro Ala Pro Thr Gly Tyr Ala Cys Thr Thr Pro Arg Glu Ala Glu
 20 25 30

Glu Ala Ala Ser Lys Ile Gly Ala Gly
 35 40

<210> 11

<211> 60

<212> PRT

<213> Escherichia coli

<400> 11

Met Asn Leu His Glu Tyr Gln Ala Lys Gln Leu Phe Ala Arg Tyr Gly
 1 5 10 15

Leu Pro Ala Pro Val Gly Tyr Ala Cys Thr Thr Pro Arg Glu Ala Glu
 20 25 30

Glu Ala Ala Ser Lys Ile Gly Ala Gly Pro Trp Val Val Lys Cys Gln
 35 40 45

Val His Ala Gly Gly Arg Gly Lys Ala Gly Gly Val
 50 55 60

<210> 12

<211> 58

<212> PRT

<213> Escherichia coli

<400> 12

Phe Leu Ile Asp Ser Arg Asp Thr Glu Thr Asp Ser Arg Leu Asp Gly
1 5 10 15

Leu Ser Asp Ala Phe Ser Val Phe Arg Cys His Ser Ile Met Asn Cys
20 25 30

Val Ser Val Cys Pro Lys Gly Leu Asn Pro Thr Arg Ala Ile Gly His
35 40 45

Ile Lys Ser Met Leu Leu Gln Arg Asn Ala
50 55